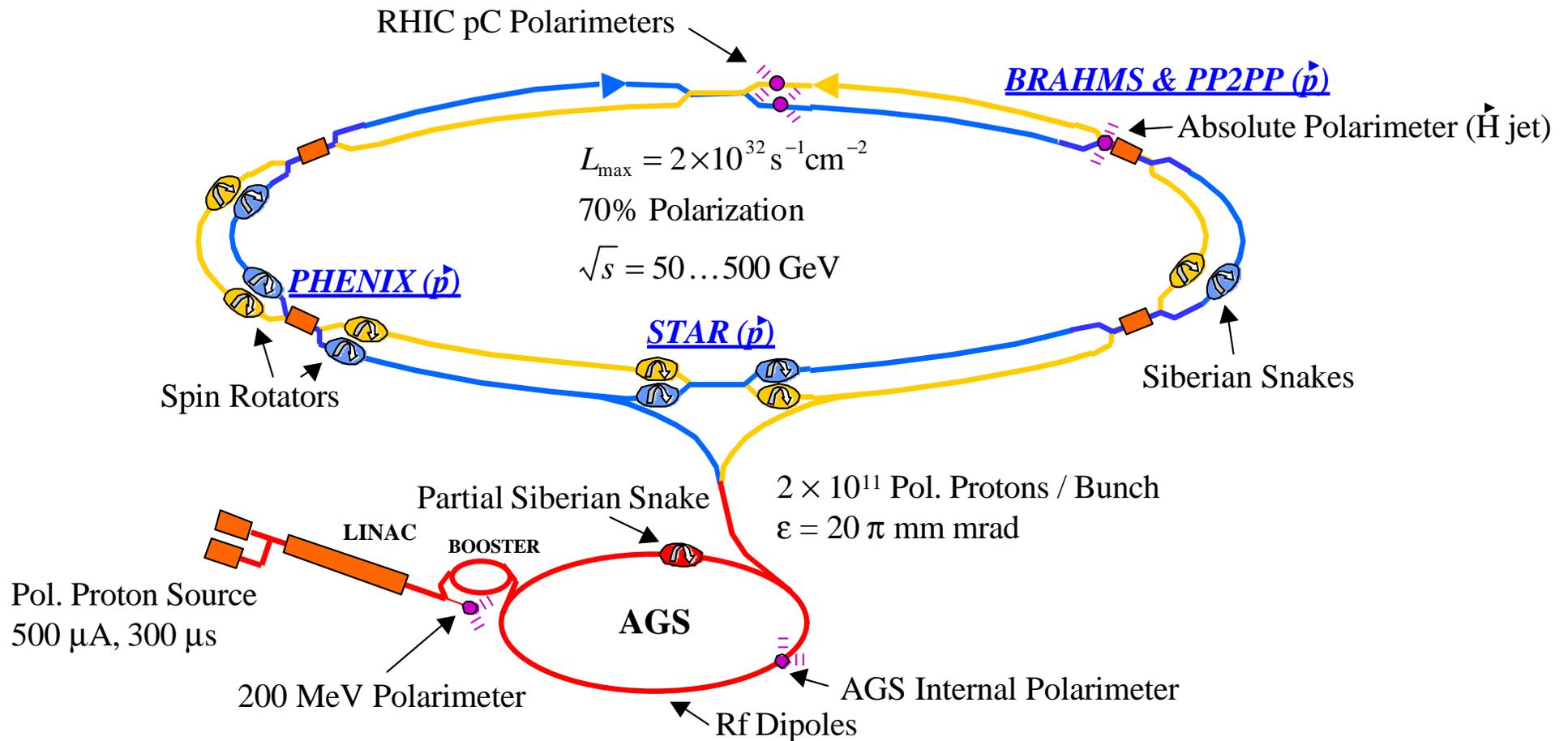


Plans for Snake Charming

- Introduction
- FY2001 run configuration and goals
- Turning off 1 snake at storage
- Concerns and details

Polarized Protons in RHIC



‡ Polarized proton status and plans ‡

FY2000 run:

- ‡ Single Siberian snake and pC polarimeter installed in Blue ring.✓
- ‡ New polarized proton source: $\sim 10^{12}$ polarized protons/pulse.✓
- ‡ Goal: Accelerate polarized beam in Blue ring.✓

FY2001 run:

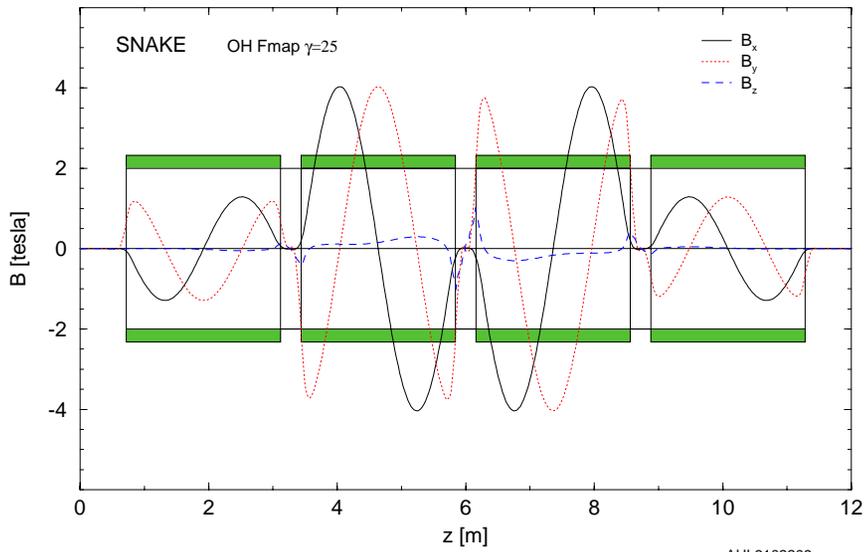
- ‡ 2 snakes/ring and 1 pC polarimeter/ring installed in RHIC.
- ‡ Goals: 100 GeV \times 100 GeV collisions with long. pol. at all IR's.
Accelerate polarized protons to 250 GeV.

FY2002 run:

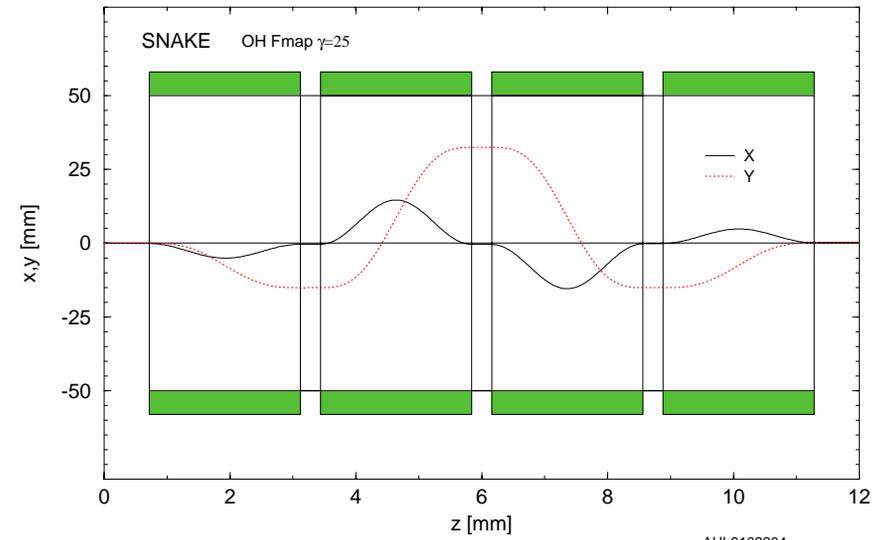
- ‡ 8 spin rotators installed around STAR and PHENIX.
- ‡ Goal: 250 GeV \times 250 GeV collisions with long. pol. at STAR and PHENIX.

FY2003 run:

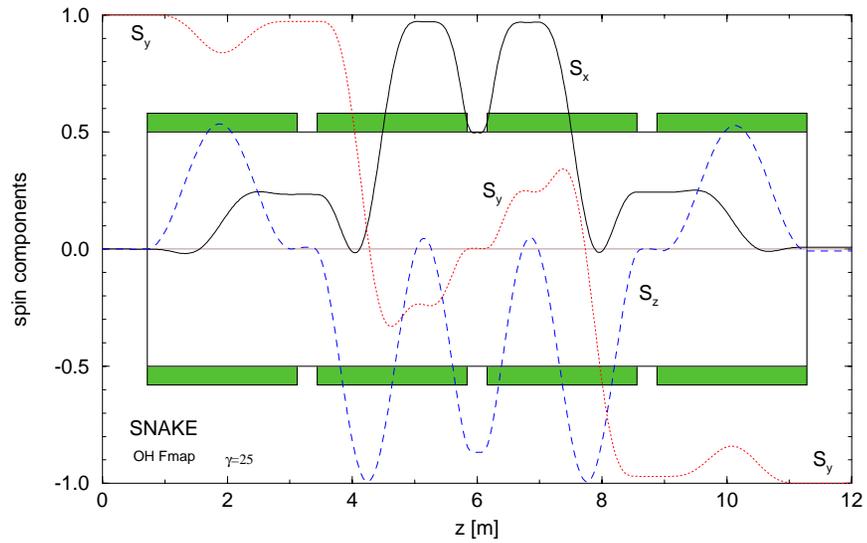
- ‡ Polarized hydrogen jet target for absolute polarimetry installed.



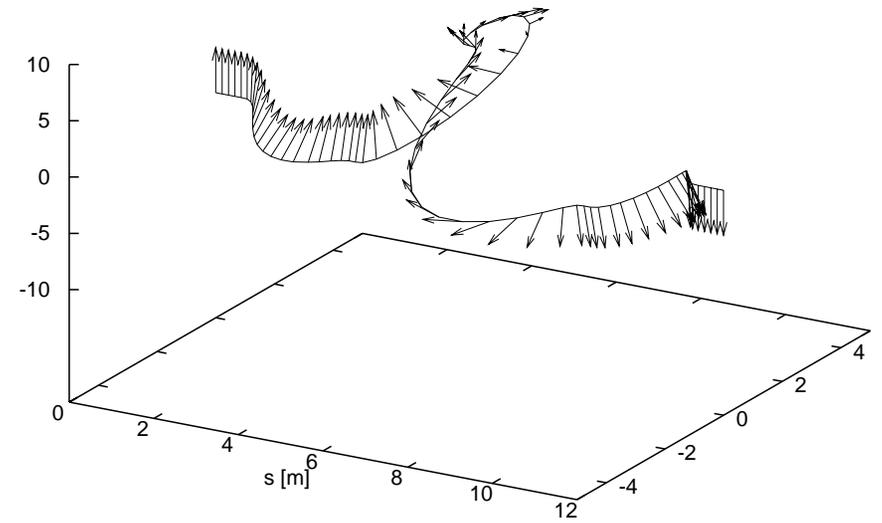
AUL6102206

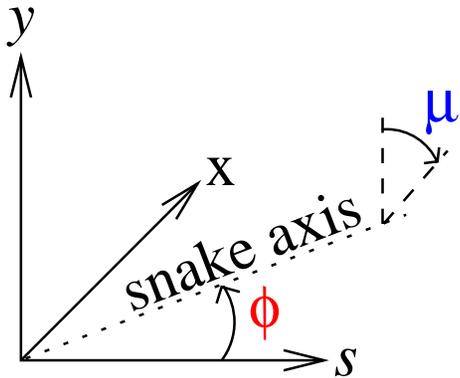


AUL6102204



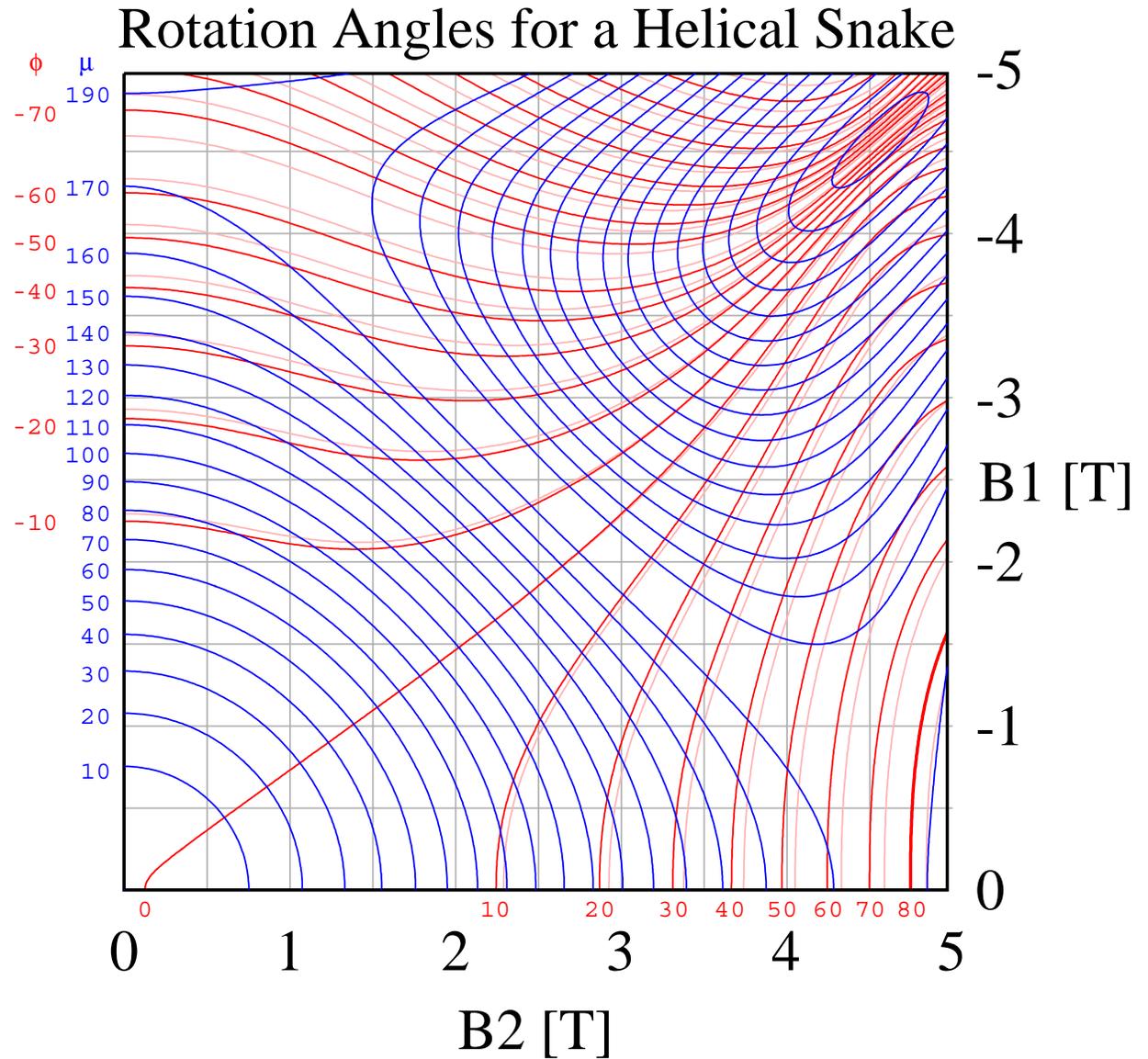
AUL6102210



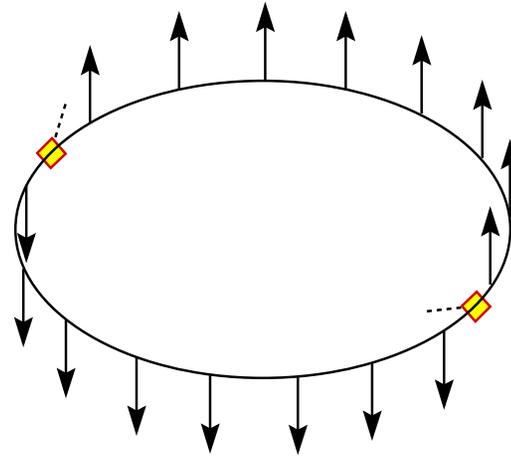


The rotation axis of the snake is ϕ , and μ is the rotation angle.

Note that the ϕ contours shift slightly from injection (red) at 25 GeV to storage (pink) at 250 GeV.



Spin tune with two snakes
 $[\mu_1, \phi_1]$ and $[\mu_2, \phi_2]$ on opposite
sides of ring: $\nu = \delta/2\pi$ where



$$\cos \frac{\delta}{2} = \cos \frac{\mu_2}{2} \cos \frac{\mu_1}{2} \cos G\gamma\pi - \sin \frac{\mu_2}{2} \sin \frac{\mu_1}{2} \cos(\phi_2 - \phi_1).$$

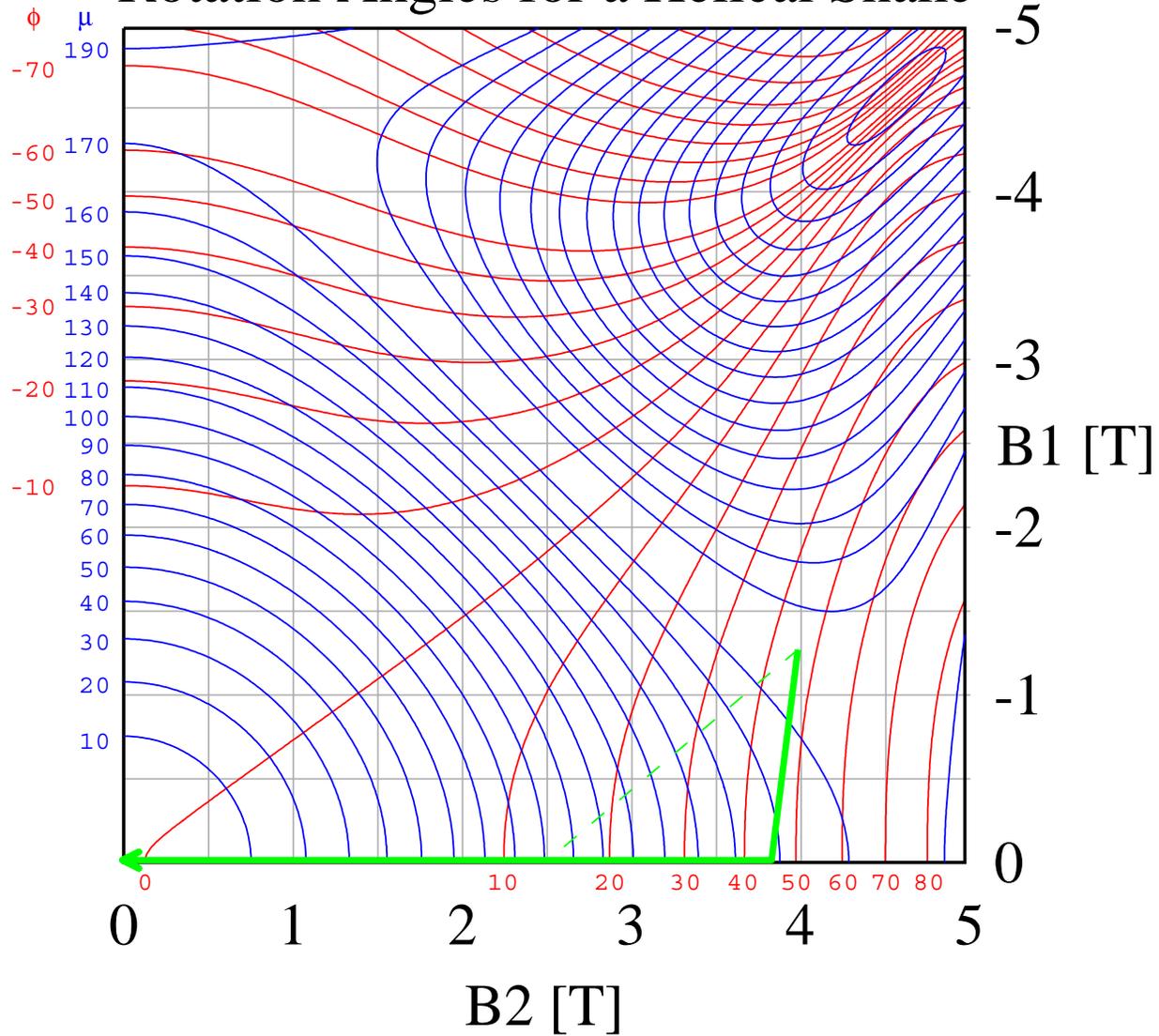
and $G = \frac{g-2}{g} = 1.7928$ for protons.

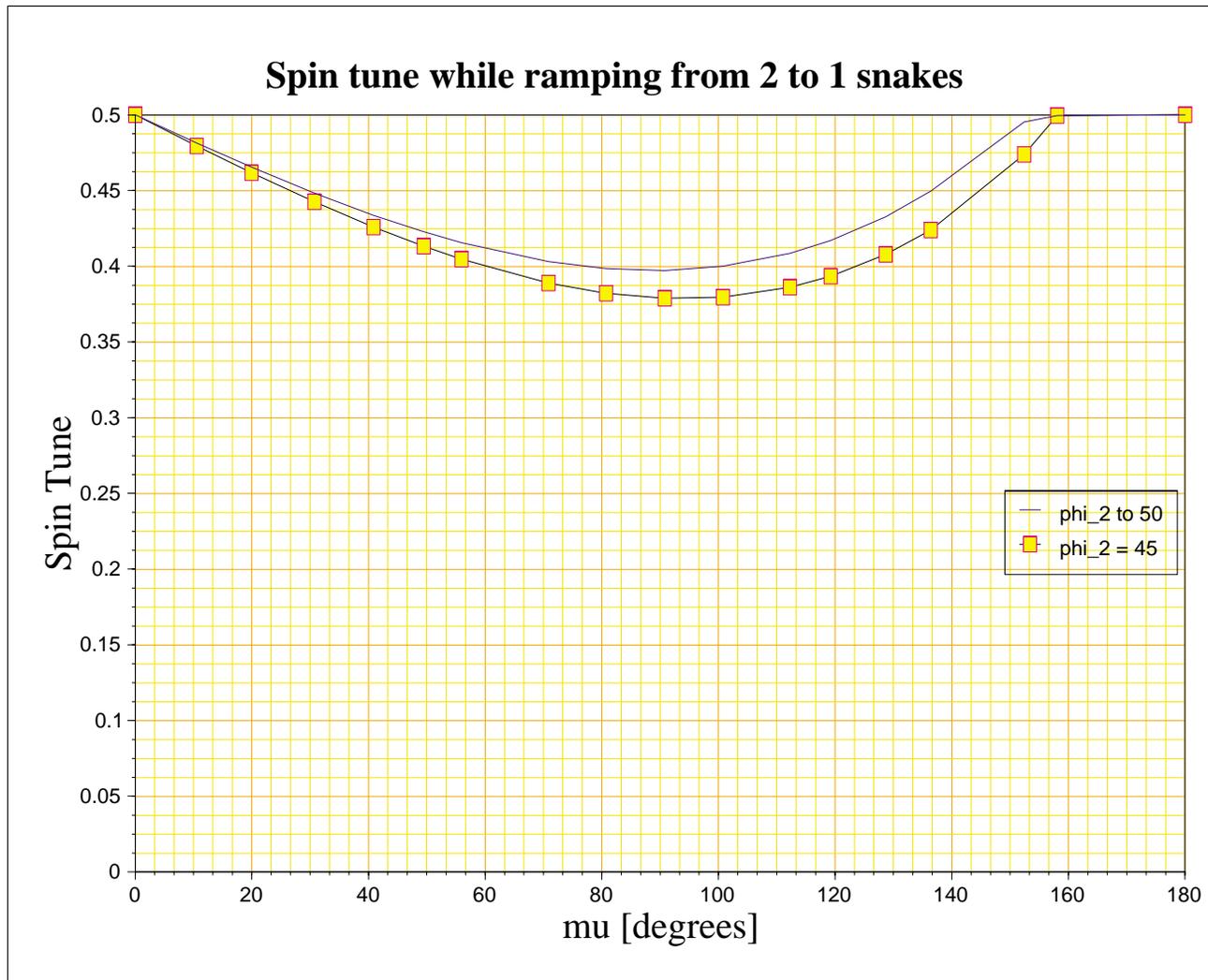
For $\mu_1 = \pi$,

$$\cos \frac{\delta}{2} = -\sin \frac{\mu_2}{2} \cos(\phi_2 - \phi_1),$$

$\nu = 0.5$ for either $\mu_2 = 0^\circ$ or $\phi_2 - \phi_1 = 90^\circ$.

Rotation Angles for a Helical Snake





$$\nu_{\text{sp}} = \frac{1}{\pi} \cos^{-1} \left[\sin \frac{\mu}{2} \cos(\phi_2 - \phi_1) \right]$$

⌘ Concerns and Details ⌘

- ⌘ Must get all 8 power supplies up and running.
 - first pair: move \Rightarrow alcove.
 - next 6: assemble, install, and test.
- ⌘ Orbit and optics:
 - Improve orbit correction: $\sigma \lesssim 0.2$ mm
 - Locally correct orbits with each snake on.
 - Correct tunes with snakes on.
 - Local decoupling around snake and at IR's?
(Could reduce effects of horizontal tune on spin.)
- ⌘ Accelerate with snakes:
 - Local snake orbit correction does “not” ramp (with β not γ).
 - Track betatron tunes.
 - May have small nonlinear effect from decreasing “snake hump”.
- ⌘ Do we have resonances from $\nu_{sp} = 0.5 \rightarrow 0.37$?
 - Should have a little margin to tweak second snake-axis.
 - Track betatron tunes as we turn off one snake.